

# Taxonomic Studies of *Bistorta* (Polygonaceae) in the Himalayas and Adjacent Regions (2). — *Bistorta amplexicaulis* (D. Don) Greene and Its Allies, with Special Reference to the Ochreae and Leaf Sheathes of Cauline Leaves

Koji YONEKURA<sup>a</sup> and Hiroyoshi OHASHI<sup>b</sup>

<sup>a</sup>The Mt. Hakkoda Botanical Laboratory, Graduate School of Science,  
Tohoku University, Aomori, 030-0111 JAPAN;

<sup>b</sup>Botanical Garden, Graduate School of Science, Tohoku University, Sendai, 980-0862 JAPAN

(Received on September 25, 2001)

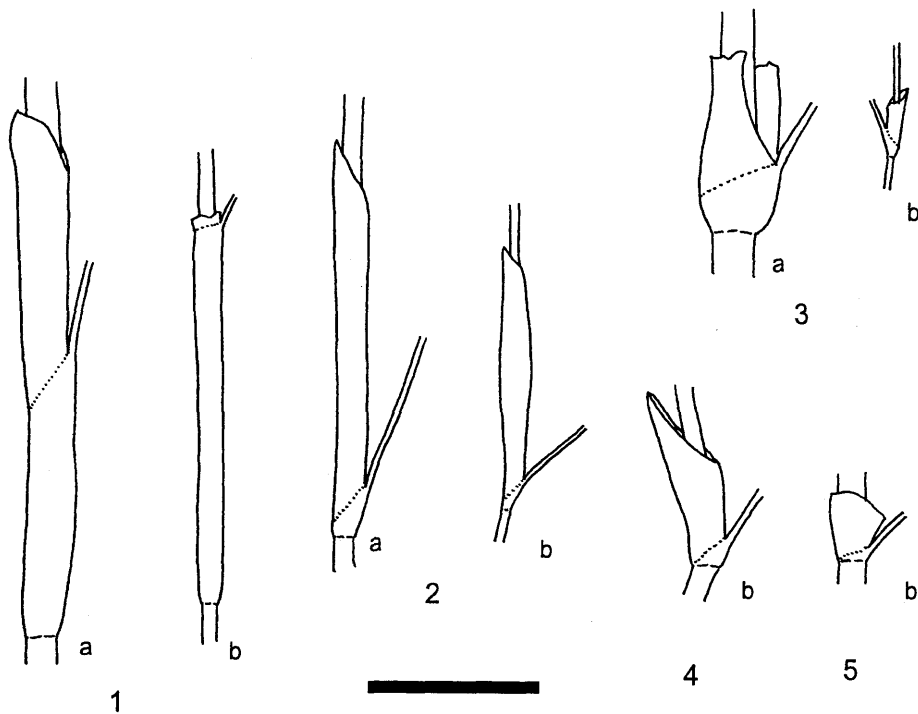
*Bistorta amplexicaulis* (D. Don) Greene and its allies are taxonomically revised. Well-developed leaf sheathes of cauline leaves are considered as an apomorphic character in *Bistorta*, and *B. amplexicaulis* lacking such leaf sheathes is assumed as a primitive species in the genus. A new variety, *B. amplexicaulis* subsp. *amplexicaulis* var. *dhorpattanensis* Yonek. & H. Ohashi, is described from central Nepal. *Bistorta amplexicaulis* subsp. *sinensis* (Forbes & Hemsl.) Soják is regarded as a species distinct from *B. amplexicaulis* and a new name, *B. henryi* Yonek. & H. Ohashi, is proposed for it. *Bistorta sinomontana* (Sam.) Miyam. is reduced to a subspecies of *B. amplexicaulis* and a new combination, *B. amplexicaulis* subsp. *sinomontana* (Sam.) Yonek. & H. Ohashi, is proposed.

**Key words:** *Bistorta amplexicaulis*, *Bistorta henryi*, leaf sheath, ochrea, taxonomy.

*Bistorta amplexicaulis* (D. Don) Greene is a rather common species in the moist temperate to alpine regions of the Himalayas to central China. This species is characterized by elongated, branched thick woody rhizomes and ovate cordate leaves, but is variable in its general habits, inflorescence sizes, and colours and sizes of flowers. Due to its variability this species has been divided into several infraspecific taxa or even into several distinct species (Meisner 1826, Steward 1930, Munshi and Jabeid 1986).

The ochrea is an organ characteristic to the subfamily Polygonioideae of Polygonaceae and regarded as useful in classification of some groups (Steward 1930, Park 1988), but in *Bistorta* all species have tubular glabrous ochreae similar in shape and hence

less attentions have been paid to their taxonomic value. During our revisional work, we found that ratio of the leaf sheath to the ochrea in the cauline leaf is taxonomically significant in *Bistorta* (Yonekura and Ohashi 1999, 2001). Most species of *Bistorta* have cauline leaves with well developed tubular leaf sheathes much longer than their diameter and less developed ochreae (Fig. 1), while some species including *B. amplexicaulis* have poorly developed leaf sheathes hardly forming complete tubes and long ochreae even in the uppermost cauline leaves (Fig. 2). These two patterns are distributed in *Bistorta* and related genera, i. e., *Aconogonon*, *Koenigia*, *Persicaria* and *Fagopyrum* belonging to the tribe Persicarieae (Haraldson 1978, Ronse Decraene and



Figs. 1–5. Leaf sheaths and ochreae of cauline leaves in *Bistorta* and its allied genera. Dotted lines indicate borders between leaf sheaths (lower part) and ochreae (upper part); broken lines indicate stem nodes. For convenience, nerves and hairs on ochreae and leaf sheaths are omitted and cauline leaves are represented by their costae. 1. *B. major* var. *japonica* (Ohashi et al. 28175, TUS). 2. *Bistorta amplexicaulis* subsp. *sinomontana* (Yü 15380, A). 3. *Persicaria lapathifolia* (Sato s. n., TUSG). 4. *Aconogonon weyrichii* (Naito 7288, TUSG). 5. *Fagopyrum dibotrys* (Yamanaka s. n., TUSG). a: Lower leaves. b: Upper leaves. Scale bar = 2 cm.

Akeroyd 1988) as shown in Table 1. Genera related to *Bistorta* have poorly developed leaf sheaths hardly forming complete tubes and developed ochreae (Figs. 3–5). In *Bistorta* species with poorly developed leaf sheaths have underground organs different from majority of this genus, i. e., much elongated and branched rhizomes as in *B. amplexicaulis* or woody wiry prostrate stems against short thick unbranched tortuous (“bistort”) rhizomes from which the generic name is derived. Genera related to *Bistorta* have various shape of underground organs but no species in these genera have “bistort” rhizomes. Based on these facts we consider

that the well developed leaf sheath of the cauline leaf is an apomorphic character in *Bistorta* and *B. amplexicaulis* is situated on the primitive position in this genus. Although some infraspecific taxa of *B. major* Gray (= *Polygonum bistorta* L.) are somewhat similar to *B. amplexicaulis* in general appearance, they are easily distinguishable from the latter by their ochreae and leaf sheaths of cauline leaves (Figs. 1, 2).

In the Himalayas westwards from Bhutan *Bistorta amplexicaulis* grows in wide range of habitats and elevations, but keeps stable features, i. e., the ovate to elliptic leaves with almost wingless petioles, floral bracts partly

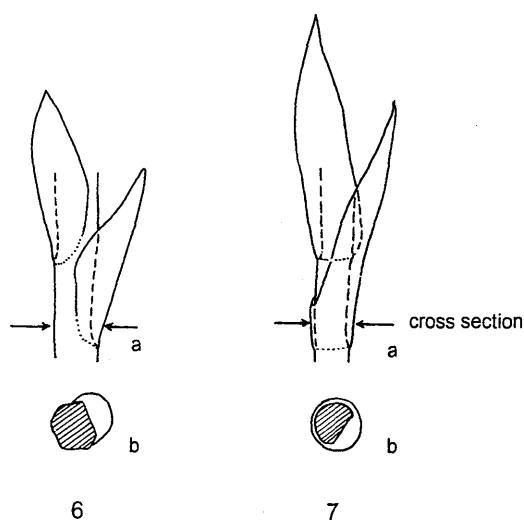
Table 1. Development of leaf sheathes and ochreae in the *Bistorta* species and its allied genera. Species with asterisk (\*) have short unbranched thick tortuous rhizomes common in *Bistorta*. In species above *B. vivipara* ochreae of upper cauline leaves are much shorter than the leaf sheathes and often vestigial

Leaf sheathes ill-developed; ochreae well-developed	Leaf sheathes well-developed; Ochreae ill-developed
	<i>Bistorta bistortoides</i> *
	<i>B. confusa</i> *
	<i>B. coriacea</i> *
	<i>B. hayachinensis</i> *
	<i>B. macrophylla</i> *
	<i>B. major</i> *
	<i>B. plumosa</i> *
	<i>B. tenuicaulis</i>
	<i>B. vivipara</i> *
	<i>B. affinis</i>
	<i>B. burmanica</i> *
	<i>B. diopetes</i> *
	<i>B. griffithii</i>
	<i>B. hayachinensis</i> *
	<i>B. longispicata</i> *
	<i>B. ludlowii</i> *
	<i>B. millettioides</i> *
	<i>B. perpusilla</i> *
	<i>B. purpureonervosa</i> *
	<i>B. rubre</i> *
	<i>B. sherei</i> *
	<i>B. subscaposa</i> *
<i>Bistorta abukumensis</i>	
<i>B. amplexicaulis</i>	
<i>B. emodi</i>	
<i>B. suffulta</i>	
<i>B. vacciniifolia</i>	
<i>Persicaria</i>	
<i>Aconogonon</i>	
<i>Koenigia</i>	
<i>Fagopyrum</i>	

inserted in the inflorescence rachis but not completely surrounding it (Fig. 6), and hermaphrodite flowers with tepals obtuse or rounded at apex. Two groups are recognized based on difference in the inflorescence orientation; a group with erect inflorescences growing in the cool temperate zone, and the other group with pendulous inflorescences growing in the alpine zone from central

Nepal to western Bhutan. Although altitudinal distribution ranges of both groups are overlapping as shown in Fig. 8, they are generally isolated from each other and intermediates are very rarely found.

The former group is very variable. The commonest form has rather short inflorescences with deep red flowers 1–4 in each node and occurs in Nepal and adjacent re-



Figs. 6–7. Inflorescence rachis with bracts (a) and schematic figures of their cross-section between arrows (b). Dotted lines indicate connections between bracts and rachis. For convenience, bracteoles and flowers are omitted. 6. *Bistorta amplexicaulis* subsp. *amplexicaulis*. 7. *B. henryi* (= *B. amplexicaulis* subsp. *sinensis*).

gions. In the western Himalaya individuals with long inflorescences and white or pinkish smaller flowers are frequently found and have been named *Polygonum ambiguum* Meisn. or *P. oxyphyllum* Meisn. On the other hand, plants with short thick inflorescences with red large flowers are known in the higher elevations in Sikkim and eastern Nepal and have been named *Polygonum speciosum* Meisn. These forms are, however, connected with many intermediates and geographical isolations among these forms are not observed according to our field researches in Nepal and examinations of specimens. At present we regard this group as a highly polymorphic taxon of varietal level without further subdivision.

The latter group has been recognized as a distinct variety, var. *pendula* H.Hara (Hara 1975, 1982). The type specimen collected from Gosainkund area in central Nepal has

acute or subobtusate leaves and drooping inflorescences with one flower in each node, whose tepals are red, broadly elliptic and rounded at apex. All individuals of this group from central and eastern Nepal westwards to Manaslu Himal share such characters and its varietal rank is acceptable. Noshiro et al. 9760372 (TUS) from the upper Iswa Khola valley in eastern Nepal has white tepals with reddish veinlets, but it is nothing more than a form. Hara (1975) pointed out papillae on the lower surface of leaves as a diagnostic character of this variety, but they are also found in several specimens of var. *amplexicaulis* (e. g., Suzuki et al. 9460098 (TUS) and Mikage et al. 9685283 (TUS)).

Several collections of *Bistorta amplexicaulis* from Dhorpatan region in south of Dhaulagiri Himal and Modi Khola Valley of Annapurna Himal in central Nepal are similar to var. *pendula* in having drooping inflorescences, but are different by their inflorescences with usually two or three pink flowers in each node and by their tepals narrower than var. *pendula*. Their localities are separated from the distribution area of var. *pendula* by Marsyandi valley as shown in Fig. 8. According to the field observation by the first author in Dhorpatan region, they were growing in alpine grasslands and adjacent *Betula* – *Sorbus* forests more than 3490 m at altitudes. Individuals of var. *amplexicaulis* were sometimes found together in same places but only one individual was found intermediate between them. We consider the collections as a distinct variety and named it as var. *dhorpatanensis* Yonek. & H.Ohashi.

Munshi and Jabeid (1986) recorded *Bistorta pacifica* (Petrov ex Kom.) Kom., originally described from Primorsky region of Russian Far East, from Kashmir of north-western India. Judging from their description and a photograph of the specimen (Munshi and Jabeid 1986 Pl. XXIII, Fig. 6) this plant has branched stems, poorly developed leaf

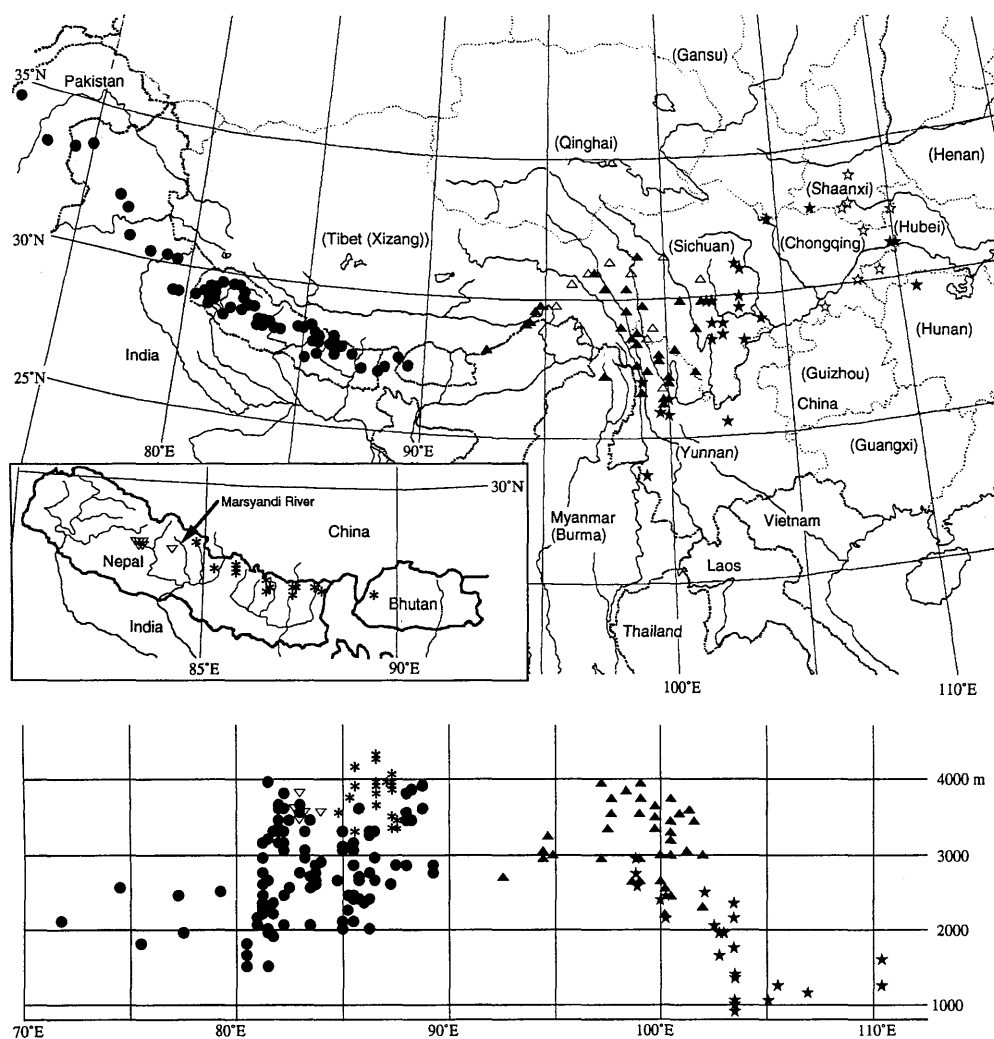


Fig. 8. Distributions of *Bistorta amplexicaulis* and its allies. ●: subsp. *amplexicaulis* var. *amplexicaulis*. \*: subsp. *amplexicaulis* var. *pendula*. ▽: subsp. *amplexicaulis* var. *dhorpatanensis*. ▲, △: subsp. *sinomontana*. ★, ☆: *Bistorta henryi* (= *B. amplexicaulis* subsp. *sinensis*). Localities indicated by △ and ☆ are after Anonymous (1974), Ding et al. (1981), Li (1983, 1993); those indicated by the other symbols are based on herbarium specimens.

sheathes, long tubular ochreae even in upper cauline leaves and erect inflorescences. These features are identical with those of *B. amplexicaulis* var. *amplexicaulis* but different from *B. pacifica*. Munshi and Jabeid (1986) distinguished it from *B. amplexicaulis* by the filament length and length of petioles of radical leaves, but such characters are not

useful for distinguishing the two species. The plant identified as *B. pacifica* by Munshi and Jabeid seems nothing but *B. amplexicaulis* var. *amplexicaulis*, hence *B. pacifica* should be excluded from the Himalayan flora.

*Polygonum sinomontanum* Sam., distributed in the Hengduan Mountain Region of

Southwest China, was originally characterized by its narrowly lanceolate leaves similar to some races of *Bistorta major* (*Polygonum bistorta*) in eastern Asia (Samuelsson 1929) but its distinctness from *B. major* had been considered as dubious (Steward 1930, Kitagawa 1938, Hara 1952) until Li (1983, 1998) recognized it as a distinct species based on rhizome characters which is similar to *B. amplexicaulis*. Miyamoto (1999) considered the species as closely related to *B. amplexicaulis* and proposed a new combination, *B. sinomontana* (Sam.) Miyam. Characters of ochreae, leaf sheathes and bracts of *B. sinomontana* are identical with those of *B. amplexicaulis* which support Miyamoto's view (1999). Leaf shape of *B. sinomontana* is, however, quite variable through the whole distribution area (Fig. 9) and plants with ovate leaves similar to *B. amplexicaulis* are frequently observed. Such individuals were erroneously identified by Li (1983, 1993, 1998) as *B. amplexicaulis* (as *Polygonum amplexicaule*). Miyamoto (1999) used the presence of wings on leaf petioles as a key character to distinguish *B. sinomontana* from *B. amplexicaulis*, but specimens with narrow wings on the upper part of them are frequently observed in the Himalayan *B. amplexicaulis*, although *B. sinomontana* has constantly wider and frequently undulate wings on leaf petioles irrespective of their leaf width. There are some differences between them in the flowering orientations and tepal shapes as shown in the following key, but these are not always stable. The distinction between *B. sinomontana* and *B. amplexicaulis* seems to be insufficient to regard them as distinct species from each other. We regard the former as a geographically separated subspecies of the latter.

In the temperate regions of central to southwestern China another infraspecific taxon of *Bistorta amplexicaulis*, subsp. *sinensis* (Forbes & Hemsl.) Soják, is known. It was described as a variety of *B. am-*

*plexicaulis* (as *Polygonum amplexicaule*) based on the differences of flower density in inflorescences, bract texture and achenes (Steward 1930, Li 1998), although some of such differences are not clear. Subspecies *sinensis* is, however, clearly distinct from Himalayan *B. amplexicaulis* by the insertion of bracts; completely surrounding the inflorescence rachis forming sheathes at base in the former (Fig. 7), while slightly inserted in the rachis and not forming sheathes in the latter (Fig. 6). The former is also different from the latter in its gynodioecious sex expression and completely wingless leaf petioles. In southwestern Sichuan and northwestern Yunnan *Bistorta amplexicaulis* subsp. *sinomontana* grows with subsp. *sinensis*, but no intermediates are observed. Although *B. amplexicaulis* subsp. *sinensis* is closely related from *B. amplexicaulis* (including *B. sinomontana*), it should be regarded as a distinct species. A new name *Bistorta henryi* Yonek. & H. Ohashi is proposed here for the former because if the epithet '*sinensis*' is used then resulted combination is a later homonym of *B. chinensis* H. Gross (1913).

A key to the species and infraspecific taxa of *Bistorta amplexicaulis* is given below:

1. Gynodioecious; leaf petioles wingless; inflorescence rachis without ridges; bracts surrounding the rachis forming short sheathes at base; tepals pink, ovate, subacute at apex; achenes usually brown, opaque ..... *Bistorta henryi*
1. Hermaphrodite; inflorescence rachis weakly ridged; bracts never surrounding the rachis nor forming sheathes; tepals red, pink or white, elliptic or oblong, rounded or obtuse at apex; achenes usually deep brown, lustrous ..... *Bistorta amplexicaulis*
2. Blades of radical and lower cauline leaves ovate to oblong, petioles wingless

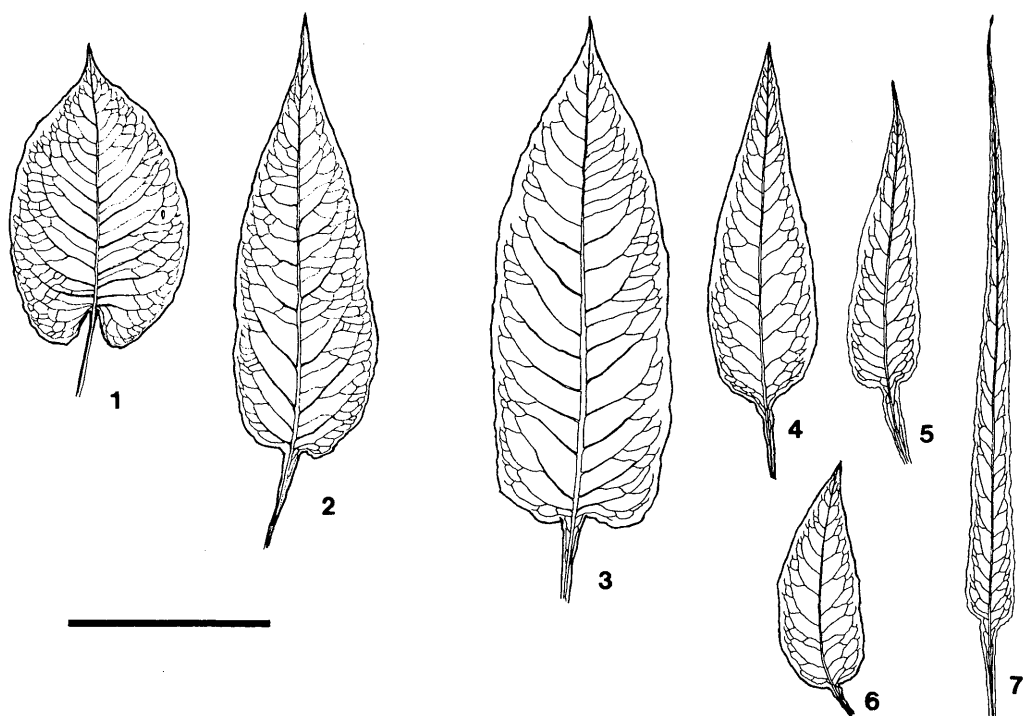


Fig. 9. Variation of lower cauline leaves in *Bistorta amplexicaulis* subsp. *amplexicaulis* and subsp. *sinomontana*. 1, 2: subsp. *amplexicaulis*. 3–8: subsp. *sinomontana*. Voucher specimens. 1: Mikage et al. 9682687 (TUS). 2: Suzuki et al. 9193241 (TUS). 3: Murata et al. 1057 (TUS). 4: Ching 30472 (A). 5: Yü 9999 (A). 6: Murata et al. 607 (TI). 7: Soulié 272 (NY). Scale bar = 5 cm.

- or narrowly winged, if winged wings not undulate at margin; inflorescences usually flowering upward; keels at apex of abaxial side of outer tepals distinct.....  
 ..... subsp. *amplexicaulis*
3. Inflorescences erect .....  
 .....var. *amplexicaulis*
3. Inflorescences pendulous.
4. One flower per node of inflorescence; tepals red or rarely white with red nerves, broadly elliptic; adaxial inner tepals more than 2.4 mm wide .....  
 .....var. *pendula*
4. Two or three (rarely one) flowers per node of inflorescence; tepals pink, elliptic or narrowly elliptic; adaxial inner tepals less than 2.5 mm wide.....

- .....var. *dhorpatanensis*
2. Blades of radical and lower cauline leaves lanceolate to ovate-oblong, petioles distinctly winged, wings usually undulate at margin; inflorescences dominantly flowering downward; keels at apex of abaxial side of outer tepals sometimes indistinct .....subsp. *sinomontana*

***Bistorta amplexicaulis*** (D.Don) Greene, Leaf. Bot. Obs. Crit. 1: 21 (1904); H.Gross in Bull. Géogr. Bot. (Le Mans) 23: 15 (1913); H.Hara, Fl. E. Himal.: 69 (1966), in H.Ohashi, Fl. E. Himal. 3: 29 (1975) et in H.Hara & al., Enum. Flow. Pl. Nepal 3: 173 (1982); Grierson & Long, Fl. Bhutan 1(1): 167 (1983); Munshi & Jabeid in J. Econ.

Taxon. Bot. Addit. Ser. 2 (Polyg. Kashmir Himal.): 60 (1986).

*Polygonum amplexicaule* D.Don, Prodr. Fl. Nepal.: 70 (1825); Meisn., Monogr. Gen. Polyg. Prodr.: 51 (1826), in Wall., Pl. Asiat. Rar. 3: 54 (1832) et in DC., Prodr. 14: 126 (1856); Spreng., Syst. Veg. ed. 16, 4(2): Cur. Post.: 154 (1827); Babington in Trans. Linn. Soc. London 18: 96 (1838); Hook.f. in Curtis's Bot. Mag.: t. 6500 (1880) et Fl. Brit. Ind. 5: 32 (1886); Steward in Contr. Gray Herb. 88: 30 (1930), excl. var. *sinense*; Kitam. in Kihara & al., Fauna & Fl. Nep. Himal.: 115 (1955) et Fl. Afghan.: 89 (1960); Webb & Chater in Tutin & al., Fl. Europ. 1: 80 (1964); Stewart, Fl. W. Pakistan: 203 (1977); A.J.Li in C.Y.Wu, Fl. Xizang., 1: 612, fig. 194; 1 & 2 (1983), in W.T.Wang, Vasc. Pl. Hengduan Mountains 1: 362 (1993), et Fl. Reipubl. Popul. Sin. 25 (1): 488 (1998), excl. var. *sinense*; T.Y.Ding in C.Y.Wu & al. (eds.) Fl. Yunnan. 11: 339 (2000), excl. var. *sinense*.

*Persicaria amplexicaulis* (D.Don) Ronse Decr. in Ronse Decr. & Akeroyd in Bot. J. Linn. Soc. 98: 368 (1988).

Type. **INDIA**: Uttar Pradesh, Garhwal, Srinagar ("Sirinagur"). (Kanroop (Bunmoora Indigenis), Holotype in BM, non vidi).

subsp. **amplexicaulis**.

var. **amplexicaulis**.

*Polygonum petiolatum* D.Don, Prodr. Fl. Nepal.: 70 (1825); Meisn., Monogr. Gen. Polyg. Prodr. 51 (1826); Sprengel, Syst. Veg. ed. 16, 4 (2): Cur. Post. 154 (1827). Type. **NEPAL**: "Napalia", sine loco spec. (N. Wallich s. n., Holotype in BM, non vidi).

*Bistorta petiolata* (D.Don) Petrov in Bull. Jard. Bot. Princip. URSS 27: 233 (1928).

*Polygonum speciosum* Meisn., Monogr. Gen. Polyg. Prodr.: 66 (1826), in Wall., Pl. Asiat. Rar 3: 53 (1832) et in DC., Prodr. 14: 126 (1856). Types. **NEPAL**: "E. Napalia", sine loco spec. (N. Wallich s. n., ann. 1819, Lectotype selected here in G-DC, Microfische!); "Napaul", sine loco spec. (N.

Wallich s. n., ann. 1821, Syntype in G-DC, Microfische!). – see nomenclatural note.

*P. amplexicaule* var. *speciosum* (Meisn.) Hook.f., Fl. Brit. Ind. 5: 33 (1886); Sam. in Hand.-Mazz., Symb. Sin. 7: 176 (1929), quoad nom. tant., excl. specim.

*Bistorta speciosa* (Meisn.) Greene, Leaf. Bot. Obs. Crit. 1: 21 (1904).

*B. amplexicaulis* var. *speciosa* (Meisn.) Munshi & Jabeid in J. Econ. Taxon. Bot. Addit. Ser. 2 (Polyg. Kashmir Himal.): 60 (1986), comb. nud.

*Polygonum ambiguum* Meisn. in Wall., Pl. Asiat. Rar. 3: 54 (1832). Type: **INDIA**: Uttar Pradesh, Kumaon (R. Blinkworth s. n., Isotype in G-DC, Microfische!, K-W, Microfische!).

*P. amplexicaule* D.Don  $\alpha$ . (var.) *ambiguum* (Meisn.) Meisn. in DC., Prodr. 14: 126 (1856).

*Polygonum oxyphyllum* Wall. [Cat. no. 1715 (1829), nom. nud.] ex Meisn. in Wall., Pl. Asiat. Rar. 3: 54 (1832). Type: **INDIA**: Uttar Pradesh, Kumaon (R. Blinkworth s. n., Isotype in K-W, Microfische!).

*P. amplexicaule* D.Don  $\beta$ . (var.) *oxyphyllum* (Wall. ex Meisn.) Meisn. in DC., Prodr. 14: 126 (1856).

*Bistorta oxyphylla* (Wall. ex Meisn.) Greene, Leaf. Bot. Obs. Crit. 1: 21 (1904).

*Bistorta amplexicaulis* var. *alba* Munshi & Jabeid in J. Econ. Taxon. Bot. Addit. Ser. 2 (Polyg. Kashmir Himal.): 61, pl. XXIV, fig. 3 (1986). Type: **INDIA**: Kashmir, Tangamarg, alt. 2508 m (A.H. Munshi 747, 6 Aug. 1975, Holotype in KASH, non vidi).

*Bistorta pacifica* auct. non (Petrov ex Kom.) Kom.: Munshi & Jabeid in J. Econ. Taxon. Bot. Addit. Ser. 2 (Polyg. Kashmir Himal.): 59, pl. XXIII, fig. 6 (1986).

A perennial herb with semi-woody horizontally elongated branched rhizome 4–13 mm thick. Radical leaves fasciculate at apex of rhizomes, 7.5–45 cm long, long-petiolate; blades ovate to ovate-oblong, 3.5–15 cm long, 1.8–7.5 cm wide, acuminate at apex,

cordate at base, herbaceous, green above, paler or glaucous beneath, glabrous or pubescent beneath, margin slightly revolute, scabrous or rarely entire, veinlets near margin slightly thickened and scabrous above; petioles 3–22 cm long, wingless or with narrow entire wings at the upper half, glabrous or often papillate; ochreae brownish, membranous, 2.5–7.5 cm long. Stems erect or ascending, 15–110 cm high, telete, pale green or reddish, upper small portions of some upper internodes strongly tinged reddish purple, glabrous, usually branched from above middle; lower nodes attached with soil sometimes rooted and propagated vegetatively; cauline leaves 4–6, middle ones are usually largest, textures are as radical ones; lower cauline leaves with petioles 2–6.5 cm long, blades narrowly to broadly ovate, 3–8.5 cm long, 1.5–4.5 cm wide, acuminate at apex, cordate or rarely subtruncate at base; middle ones with petioles 1–5 cm long or subsessile, blades ovate or oblong-ovate, 5–13 cm long, 2–7 cm wide, acute to acuminate at apex, cordate at base; upper ones smaller upward, sessile, amplexicaul; leaf sheathes of cauline leaves ill developed, as long as their diameter, open at the opposite side of leaves, pale green or reddish; ochreae much longer than subsequent leaf sheathes, tubular, brown, membranous at upper half, pale green or reddish, herbaceous or chartaceous at base, glabrous or often pubescent at lower parts, 1.5–5 cm long on lower cauline leaves, (0.2–)0.5–2.5 cm on upper ones, apex 2-lobed at apex. Inflorescences erect, cylindrical, 1.1–8 cm long, 9–20 mm diam., usually flowering upward, 1–7 flowers on each node, long-peduncled; bracts brown, thick membranous, narrowly ovate, 3.5–8 mm long, acuminate at apex, almost entire, inserted at about a half of whole girth of inflorescence rachis; pedicels 2–6 mm long, white to red. Flowers white, pink, reddish-purple, red to deep red; perianthes campanulate, strongly compressed, 2.8–7.5 mm long; tepals 5, 3-

nerved, 2.3–6.5 mm long; inner ones broadly elliptic, rounded at apex, flat; outer ones elliptic, obtuse at apex, keeled at apex on abaxial side, apex of keels deep-coloured; stamens 8, subequal to tepals, filaments white to red, anthers ca. 1 mm long, dark purple; nectaries at the base of stamens dark reddish purple; styles 3, white to red, slightly exserted from perianthes; stigmas capitate, pinkish; ovaries trigonous, pale yellowish purple.

Representative specimens examined. **PAKISTAN:** Chitral, Drosh Gol (S. of Drosh), 7000 ft. (Stainton 3187, TI); *ibid.*, 8500 ft. (Bowes Lyon 156, TI); Nathia Gali (Moji s. n., 13 Oct. 1957, TI).

**INDIA:** Himalaya Boreali-Occident., Regio Temp., 6–9000 ft. (Thomson s. n., date unknown, TNS). **Kashmir**, Gulmarg, 2600 m (Kondo 758827, KYO); Pahalgam, 6000 ft. (Shresth 84, KATH). **Himachal Pradesh**, Rohtang Pass. Kothi. 2500 m (Kukkonen 6877, KYO); Tutikanda, Simla. (Sugiyama s. n., Sep. 1972, KYO); Punjab, Kulu Valley, Malana Valley. 2000 m (Tanaka 81, KYO). **Uttar Pradesh**, Panar – Seger, Chamoli Distr. 3000–3600 m (Shimizu 38021, KANA); On way to Kempty fall, Mussooree (Guha 160, TNS); Kedarnath Parbat, Harsil, 2560 m (Naithani 37529, TI); Bowali, Naini Tal (Khanna 49, KYO). **Darjeeling**, Kalapokri – Sandakphu. 3500 m (Hara s. n., 16 Sep. 1964, TI); Sandakphu (3600 m) – Phalut (3600 m). (Kanai et al. 723992, TI); Tonglu – Gairibas – Kala Pokhari – Sandakphu (Kanai et al. 723990, KYO, TI, TUS). **Sikkim**, Changu, 12000 ft. (Cooper 450, KATH); Megutang, 3900 m (Hara et al. 7454, TI); Nayathang – Phalut, 3500 m (Hara et al. 7455, TI).

**NEPAL:** **Mahakali Zone**, Baitadi Distr.; Gogan – Niglad, 1420–1720 m (Sharma et al. 429, KATH); Niglad – Chirkutte, 1720–1910 m (Sharma et al. 485, KATH – 3 sheets); Darchula Distr.; Makari Gad – Khandeshwari, 2100 m (Shakya et al. 7898, KATH); Khandeshwari – Kantel Gad, 2200 m (Shakya et al. 7953, KATH). **Seti Zone**, Bajhang Distr.; Nayaadar, 3272 m (Tabata et al. 2191, KYO); Surma Sarover, 4100 m (Bista & Joshi 591, KATH); Talkot – Aagar, 2060 m (Tabata et al. 1450, KYO); Bajura Distr.; Porakya – Dhamkane – Dojatili – Julli – Serigaon, 2310 m (Suzuki et al. 9193241, TI); Doti Distr.; Khaptad Lekh, 2800 m (Shakya et al. 6244, KATH); Napani, 2360 m (Tabata et al. 911, KATH, KYO); Rikura – Chuyadhara, 2650 m (H. Tabata et al. 1021, KATH, KYO). **Bheri Zone**, Dailekh Distr.; Bhamasen – Chhana, 2250 m (Tabata et al. 14313, KYO);

Chhanna – Bhabasen, 2400 m (Rajbhandari & Roy 2860, KYO); Jajarkot Distr.; Samaile, 2100 m (Manandhar & Joshi 6449, KATH); Surkhet Distr.; Katukuwa – Sidhapaila – Ranimatta, 81°37'E, 28°38'–41'N, 1380–2170 m (Suzuki et al. 9160040, TI). **Rapati Zone**, Rukum Distr.; Sing Khola, 3606 m (Tabata et al. 3705, KATH, KYO). **Karnali Zone**, Humla Distr.; Julliu Kharka – Munya Lagna, 3400 m (Tabata et al. 24201, KYO); Sat Thaple, 3330 m (Tabata et al. 21187, KYO); Mugu Distr.; Chittaikuna – Siranishonda, 2620 m (Tabata et al. 17365, KATH, KYO); Rara National Park, 3720 m (Tabata et al. 19491, KATH, KYO); Jumla Distr.; Chakhure Lekh, 3700 m (Manandhar & Bhattarai 8999, KATH); Danfe Pass, 3657 m (Shresta & Manandhar 99 & 119, KATH); Jumla – Bibeya, 82°10'E, 29°10'N, 2910 m (Minaki et al. 9105531, TI); Dolpa Distr.; Camp site – Rimi, 82°30'E, 29°00'N, 3510 m (Minaki et al. 9106612, TI). **Dhawalagiri Zone**, Mustang Distr.; Lete, 8500 ft. (Shresta & Bista 1921, KATH); Ghasa, S. of Tukucha, Kali Gandaki, 9000 ft. (Stainton et al. 1516, TNS); Myagdi Distr.; Jalja La – Malaini, 3080 m (Mikage et al. 9682687, TUS); Valley of Konaban Khola, above Dhobang, 83°21'–23'E, 28°37'–40'N, 3500 m (Mikage et al. 9685283, TUS); Baglung Distr.; Dhorpatan, 2800 m (Rajbhandari & Malla 6393, KATH); Dipnada, 3696 m (Tabata et al. 3838, KYO). **Gandaki Zone**, Kaski Distr.; Banthanti – Ghorapani, 83°40'E, 29°20'N, 2660 m (Suzuki et al. 8860648, TI); Doan – Machhapuchhare BC, 2700–3650 m (Suehiro 1057, KYO); Gorkha Distr.; Lungdang Gumpa, 28°28'N, 85°03'E, 3100 m (Suzuki et al. 9460151, TUS); Chhokang, 3150 m (Nakao s. n., 4 Jul. 1953, KYO, TI, TNS). **Narayani Zone**, Makawanpur Distr.; Sim Bhanjang, Indo–Nepal Highway, 2500 m (Kanai 673322, KATH, KYO); Tistung, Aglochuri Danda, 7500 ft. (Bista 3641, KATH). **Bagmati Zone**, Rasuwa Distr.; Ganesh Himal, Parbati Kund (near Gatlang) – Yure Kharka, 28°09'N, 85°14'E, 2910 m (Miyamoto et al. 9410033, TI, TNS); above Dhunche (2065 m) – Gosainkund (3000 m) (Hara et al. 69440, TI); Kyanjin – Ghora Tabela, 3100 m (Tabata et al. 18335, KYO); Nuwakot Distr.; Ghopte – Thale Patil (Kanai et al. 721976, KYO, TI, TUS); Kathmandu Distr.; Shivapuri, 8000 ft. (Malla & Rajbhandari 15, KATH); Shioupuri Ridge, Sundarija – Pati Bhanjyang – Gul Bhanjyang – Mangengot, 2000–3300 m (Idzumi & Togashi s. n., 15–25 Sep. 1979, TI, TNS); Lalitpur Distr.; Godavari (1600m) – Phulchauki (2500m) (Kanai et al. 1012, TI); Kabre Distr.; Bagdwar (near Phulchoki), 8500 ft. (Pradhan & Shresta 71, KATH); Phulchoki, S. of Kathmandu, 2700 m (Kanai 673420, KATH, KYO); Sindhupalchok Distr.; Suidurche, 27°00'N, 85°43'E, 2400 m (Dobremez 841, KATH); Thala – Tale

Bisauma, 2800 m (Kanai et al. 675139, KATH, KYO). **Janakpur Zone**, Dolakha Distr.; Chhumigaljo, Rolwaling, 3350 m (Rajbhandari & Roy 1800, KATH); Rukthang, 3300 m (Kanai et al. 672981, KATH, KYO, TUSG); Ramechhap Distr.; Deorali (2700 m) – Serdingma (3400 m), 86°20'–22'E, 27°34'–36'N (Ohba et al. 8570227, TI); Koshing Kharka – Thare Og (4150 m), 86°26'–28'E, 27°44'–45'N (Ohba et al. 8570729, TI). **Sagarmatha Zone**, Solukhumbu Distr.; Sete (2550 m) – Taktor (3000 m), 86°26'–31'E, 27°34'N (Ohba et al. 8571834, TI). **Koshi Zone**, Sankhuwasabha Distr.; Khiraunle – Thale (W. of Arun), 8650 ft. (Shakya 7106, KATH); Thudam, E. of Chyamtang, 12500 ft. (Stainton 1012, TNS). **Mechi Zone**, Singalila, Garibas – Kalapokhari, 2900 m (Hara et al. 69442, TI); Singalila, Phalut (3800–3930 m) (Hara et al. 69441, TI).

**BHUTAN**: Sele La, 2800 m (Nakao 764, KYO); ibid., 2900 m (Nakao 761, KYO).

**CHINA**: Tibet (Xizang), Gyirong Co., Rufeila?, 3200 m (Tibet–Chin. Medicinal Plant Exped. Team 365, PE-953286); Gyirong-qu, Zhacun commune, 3000 m (Qing-Zang Exped. 6938, PE-1133037); Bangxing, 3000 m (Wu et al. 75-581, PE-1132123). Nyalam Co., Zhangmu, 2700 m (Zhang & Lang 4508, PE-932756); near Quxiang, 3200 m (Tibet–Chin. Medicinal Plant Exped. Team 1588, PE-963719); on the way from Zhangmu to Quxiang, 2800 m (Zhang & Lang 4563, PE-935795).

**Distribution**: Widely distributed in the Himalayas from Pakistan to Bhutan through Kashmir, Garhwal, Nepal, Sikkim and southern Tibet (Xizang). Rather moist places in forest fringes, floors of open forests, sometimes in deforested grasslands. Alt. 1600–4000 m.

**Flowering season**: May–Nov.

**Nomenclatural note**: Meisner (1826) described *Polygonum speciosum* Meisn. based on Wallich specimens in Candolle Herbarium (G-DC). Hara (1982) cited Wall. Cat. no. 1716 as a 'type' of this species, but this specimen was received by G-DC in 1829 (cf. IDC Microfische 14–126. 162). According to the IDC Microfische, two other Wallich specimens annotated by Meisner as *Polygonum speciosum* are exist in G-DC: one collected in 1819 and another from 'E. Napalia' in 1821. We designate here the

specimen collected from 'E. Napalia' as the lectotype.

var. **pendula** H.Hara in H.Ohashi, Fl. E. Himal. 3: 30, t. 2a (1975) et in H.Hara & al., Enum. Fl. Pl. Nepal 3: 173 (1982); Grierson & Long, Fl. Bhutan 1 (1): 167 (1983).

Type. **NEPAL**: Bagmati Zone, Nuwakot Distr.; Ghopte (3500 m) – (3200 m) – Thale Patil (3400 m). "Inflorescence pendulous. Fl. same as in 721976 but position upside down. leaves glabrous above, margin revolute a little, not ciliate, papillate on the nerves below or the side of nerves below." (H.Hara & al. 721979, 26 Aug. 1972, Holotype in TI!, Isotype in KYO!, TI!).

Different from typical variety in having drooping inflorescences with one red (very rarely white) flower in each node.

Rhizomes 3.5–12 mm thick. Radical leaves 6–26 cm long; blades ovate-oblong or narrowly ovate rarely ovate, 3–10 cm long, 1.5–4.8 cm wide, acute rarely obtuse, cordate or truncate at base, papillate on nerves beneath or rarely glabrous. Stems 14–32 cm long, 3–4(–5)-leaved, simple or branched from upper nodes. Lower cauline leaves with petioles 2–6 cm long, blades ovate, 2–5 cm long, 1.3–3 cm wide, acute at apex, cordate at base; middle and upper ones smaller upward, sessile, amplexicaul. Inflorescences drooping, terminal one (2–)3–6 cm long, 11–15 mm diam., nodes 1-flowered; pedicels 4.5–7 mm long, reddish purple. Perianthes 4–6.5 mm long, red or red-purple, rarely white with reddish veinlets; tepals broadly elliptic, rounded or obtuse.

Other representative specimens examined. **NEPAL**: **Gandaki Zone**, Gorkha Distr.; Chuwa Kharka, 2833–34N, 84°39'–42'E, 3590 m (Suzuki et al. 9460228, TUS). **Bagmati Zone**, Rasuwa Distr.; Ganesh Himal, a Kharka – Ganesh Base Camp – a pass – Chyauche Kharka, 28°15'N, 85°06'E, 3650 m (Miyamoto et al. 9410259, TNS); Lahure Viyanak, 13780 ft. (Malla & Kanai 16203, KATH); Langtang, 3350 m (Sainju & Roy 33, KATH); Nuwakot Distr.; Satsae Khola, 28°03'N, 85°10'E, 3800 m (Dobremez 597, KATH);

Ghopte – Thale Patil (Kanai et al. 723996, TI); Sindhu-palchok Distr.; Dukpu, Helembu, 13000 ft. (RLF H. 16, KATH). **Janakpur Zone**, Dolakha Distr.; Beding to Nagaon, 3700 m (Rajbhandari & Roy 1941, KATH); Beding (3600 m) (Kumata s. n., 16 Aug. 1983, SAP); Ramechhap Distr.; around Baula Pokhari (3960 m) (Ohba et al. 8570342, TI); Jata Pokhari (4220 m) – Botase Kharka (4500 m) (Ohba et al. 8570588, TI); Jata Pokhari (4220 m) – W. of Panch Pokhari (4560 m) (Kurosaki & al. 8580300, TI); Mandanda, 12700 ft. (Shakya & al. 4922, KATH). **Sagarmatha Zone**, Solukhumbu Distr.; around Pike Dongshar, 3600–4000 m (Ohba & al. 8572418, TI). **Koshi Zone**, Sankhuwasabha Distr.; Lachembu – Sano Birke, 3900 m (Noshiro et al. 9760332, TUS); Pangsel Danda – Pokhari Khola, 4000 m (Noshiro et al. 9760372, TUS); above Lake on S. of Kake La, S. of Shipton La, 27°40'N, 87°13'E, 4020 m (Long et al. 334, KATH); around Cha Ding Kharka, 87°10'E, 27°40'N, 3980 m (Minaki et al. 9070176 & 9040249, TI); around Yangri Kharka, 3540 m (Suzuki et al. 8822645, TI); Chijung Khola to Jongbuk, 3410 m (Tabata & al. 11316, KATH, KYO); Lama Chungbu – Thudam (Kanai et al. 723989, TI); Thudam – Khang La, 3510 m (Tabata et al. 11537, KYO); Thudam Valley, 11200 ft. (Shresta & Joshi 402, KATH); Worale – Dhap, 4100 m (Shresta & Shakya 9160, KATH).

Distribution and habitat: Central Nepal (westwards to Manaslu Himal) to Bhutan (fide Grierson and Long 1983). Alpine grasslands. Alt. 3350–4560 m.

Flowering season: Late Jun.–Sep.

var. **dhorpatanensis** Yonek. & H.Ohashi, var. nov. (Fig. 10).

*Bistortae amplexicauli* var. *penduli* similis sed inflorescentiis longioribus 4–12 cm longis nodis quarum (1–)2–3 floriferis, floribus minoribus perianthiis 3.5–4.2 mm longis lilacinis, tepalis angustioribus oblongis vel anguste oblongis differt.

Type. **NEPAL**: Dhawalagiri Zone, Myagdi Distr.; a Pass – Chhau Kharka, 83°13'–14'E, 28°32'N, 3590 m. "On mossy rocks in deciduous forest. Fls. pink." (M. Mikage et al. 9684254, 19 Sep. 1996, Holotype in TUS, Isotypes in the Herbarium of the Faculty of Pharmaceutical Sciences, Kanazawa University, KATH, TI).

Rhizomes 5–9 mm thick, terete, long-creeping, often to 30 cm long. Radical leaves



Fig. 10. *Bistorta amplexicaulis* (D. Don) Greene subsp. *amplexicaulis* var. *dhorpatanensis* Yonek. & H. Ohashi, var. nov. a: Habit. b: Bract. c: Flower, abaxial view. d: Tepals with filaments, cut and spread out. e: A stamen on the inner whorl with nectaries at base. f: Pistil. g: Achene. Scale bar = 4 cm for a; 8 mm for b–d; 4 mm for e–g. All drawn from Mikage et al. 9684254 (TUS, Holotype).

9–29 cm long; blades narrowly ovate, 2.5–9.5 cm long, 1.7–5 cm wide, acute at apex, cordate or truncate at base, herbaceous, papillate on the veinlets beneath; petioles 6–20 cm long, reddish purple, narrowly winged at upper part. Stems erect or ascending, 24–70 cm long, simple or branched, pale green or reddish purple, small portion just below the nodes in several upper internodes dark purplish, lustrous; plants growing in forests tend to have larger much branched stems; cauline leaves (2–)3–5; lower ones similar to radical leaves in shapes and sizes; upper ones gradually smaller upward, ovate, sessile, amplexicaul; branches leafless or with 1–3 small sessile leaves. Inflorescences pendulous, 4–12 cm long, 10–13 mm diam., nodes (1–)2–3-flowered; bracts brown, hyaline, narrowly ovate, 4–7 mm long, acuminate; pedicels purplish, 5–7.5 mm long. Perianthes 3.5–4.2 mm long, pink; tepals oblong to elliptic. Achenes ovoid, trigonous, ca. 4 mm long, ca. 2.2 mm thick, brown, lustrous, beakless at apex.

Other specimens examined. **NEPAL: Dhawalagiri Zone**, Baglung Distr.; Dipnada, 3636 m (Tabata et al. 3837, KYO); Gurja Ghat, 2878 m (Tabata et al. 3868, KYO); Myagdi & Baglung Distr.; Ridge SE. of Jalja La, 28°14'–15'E, 28°30'N, 3530 m (Mikage et al. 9682647, TUS); *ibid.*, 3490 m (Mikage et al. 9682649, TUS); Myagdi Distr.; a peak west of Chhau Kharka, 83°13'–15'E, 28°32'N, 3850 m (Mikage et al. 9682884, TUS); below Chhau Kharka, 83°13'–14'E, 28°32'N, 3510 m (Mikage et al. 9682842, TUS). **Gandaki Zone**, Kaski Distr.; Hinko – Machhapuchhare BC, 3500–3650 m (Suehiro 1222 & 1223, KYO).

Distribution and habitat: Dhorpatan region south of Dhaulagiri Himal and Modi Khola Valley of Annapurna Himal, central Nepal. Alpine grassland or *Betula* – *Sorbus* forest. Alt. 3490–3900 m.

Flowering season: Aug.–Sep.

subsp. **sinomontana** (Sam.) Yonek. & H. Ohashi, comb. et stat. nov. (Fig. 11).

*Polygonum sinomontanum* Sam. in Hand.-Mazz., Symb. Sin. 7: 177 (1929); A.J. Li in

C.Y. Wu, Fl. Xizang. 1: 613 (1983), in W.T. Wang, Vasc. Pl. Hengduan Mountains 1: 361 (1993) et Fl. Reipubl. Popul. Sin. 25 (1): 39 (1998); T.Y. Ding in C.Y. Wu & al. (eds.), Fl. Yunnan. 11: 336, tab. 93; 3 (2000).

Syntypes: **CHINA**: Sichuan; Zwischen den Diabasfelsen am Gipfel des Lungdschuschen bei Huili, an der Grenze der tp. und ktp. St. 3600m (H. Handel-Mazzetti 5197, 17 Sep. 1914, W, non vidi); chiefly near Tatsienlu (A. E. Pratt 494, E, non vidi, Isosyntype in K!; Cunningham 329, E, non vidi); Tongolo (principarte de Kia-la) (J. A. Soulié 730, ann. 1893, P (non vidi), Isosyntype in A!; J. A. Soulié 2941, P, non vidi); Yunnan; Oberhalb Yendsehei an Kühlen und etwas feuchten Orten, 3300m (J. M. Delavay 3680, 7 Aug. 1888, P, non vidi); les bois pres de Hei Chan Men (J. M. Delavay 4792, 31 May 1889, P, non vidi, Isosyntype in NY!).

*Bistorta sinomontana* (Sam.) Miyam. in S. Akiyama & al. in Bull. Natn. Sci. Mus. Tokyo ser. B, 25: 153 (1999).

*Polygonum amplexicaule* auct. non D. Don; Steward in Contr. Gray Herb. 88: 30 (1930), p.p. – A.J. Li in C.Y. Wu, Fl. Xizang. 1: 612 (1983), p.p., in W.T. Wang, Vasc. Pl. Hengduan Mountains: 362 (1993), quoad specim., et Fl. Reipubl. Popul. Sin. 25(1): 44 (1998), p.p.

*Polygonum bistorta* auct. non L.; Steward in Contr. Gray Herb. 88: 35 (1930), p. p.

Different from subsp. *amplexicaulis* in stems frequently branched from its lower part; leaves narrower, usually lanceolate, petioles with distinct and undulate wings; inflorescences often flowering downward; keels on outer tepals inconspicuous.

Rhizomes elongate, to 1.2 cm thick. Radical leaves often absent at flowering time, 10–45 cm long; blades lanceolate to narrowly ovate, (4–)5–15 cm long, 14–42 mm wide, acuminate at apex, cuneate or truncate, rarely cordate at base; petioles 6.5–



Fig. 11. *Bistorta amplexicaulis* (D. Don) Greene subsp. *sinomontana* (Sam.) Yonek. & H. Ohashi. a: Habit. b: Bract. c: Flower, abaxial view; anthers fallen off. d: Tepals with filaments, cut and spread out. e: Pistil. Scale bar = 4 cm for a; 8 mm for b-d; 4 mm for e. Voucher specimens. a: Yü 15380 (A). b-e: Forrest 2606 (E).

9 cm long, distinctly winged at least in upper part, wings usually undulate. Stems erect or ascending, 25–115 cm tall, 4–8-leaved, simple or branched, glabrous or rarely pubescent, pale green, small portions just below nodes in the upper several internodes dark purplish, lustrous. Lowermost cauline leaves smaller, ovate to narrowly ovate, often absent at flowering time; lower cauline leaves large, 7.5–21 cm long, petiolate, blades lanceolate to narrowly ovate, 6–19 cm long, 11–55 mm wide, acute to acuminate at apex, broadly cuneate, truncate, rounded or cordate at base, green, above, paler or glaucous beneath, glabrous rarely papillate on veinlets above, glabrous or pubescent beneath, margin slightly revolute, veinlets at margin slightly thickened, petioles winged, wings undulate, glabrous or pubescent; upper ones gradually smaller upward, sessile, sometimes amplexicaul. Leaf sheathes of cauline leaves poorly developed. Ochreae tubular, 35–80 mm on lower cauline leaves, 9–35 mm on upper ones, brown, membranous at upper part, herbaceous or chartaceous at base, glabrous or pubescent on nerves. Inflorescences erect, cylindrical, 25–65 mm long, 8–15 mm diam., usually flowering downward or irregularly, sometimes upward, nodes 2–5-flowered; bracts hyaline, lanceolate to narrowly triangular or ovate, 4–7(–8) mm long, acuminate at apex; pedicels pink, 3.5–7(–8.5) mm long. Perianthes broadly campanulate, compressed, pink to pinkish purple, (2.7–)3–5 mm long; tepals 5, ovate-oblong to elliptic, obtuse or acute, keels at apex on abaxial side of outer tepals often inconspicuous; stamens 8, subequal to tepals, filaments 2.5–3.5 mm long, anthers dark purple to reddish purple; styles 3, free, 1.4–2 mm long; ovaries trigonous, deep red. Achenes enclosed with perianthes, trigonous, broadly rhombic-ovate or broadly rhombic-obovate in lateral view, 3.5–4 mm long, 2–2.5 mm thick, brown, lustrous, beakless at apex.

Other representative specimens examined. **CHINA:** **Tibet (Xizang);** Lhünzê Co., Anqu forester station, 2740 m (Qing-Zang Exped. Suppl. Team 750545, PE-1139743); Mainling Co., a hill at the back of Gyage, 3250 m (Qing-Zang Exped.: 74-5313, PE); Jiang-yiwomu? forestry center, 3100 m (Qing-Zang Exped. 74-1976, PE); near the town of Mainling, 3000 m (Kui et al. 2927, PE-1296785); Nyingchi Co., Juemugou, 3300 m (Kui et al. 3196, PE-1284521); W. slope of Mt. Shejilashan, alt. 3200–3750 m (Qing-Zang Exped. Suppl. Team 751122, PE); Zhag'yab Co., SW. of Gyitang, alt. 3800 m (Qing-Zang Plateau Sci. Exped. 12278, PE-1178612); Qamdo Co., Xiaoriyulong, 3000 m (Qing-Zang Plateau Sci. Exped. 12794, PE-1161474); Markam Co., Caihai ?, 4000 m (Qing-Zang Sci. Exped. 12041, PE); Gonjo Co., near Gonjo, 3800 m. (Qing-Zang Exped. Veget. Team 12591, PE-1168167); Zayü Co. (Tsawarung): Hi-ma-la. 3400 m (Wang 65595, A). **Yunnan;** sine loco spec. (Yü 7188 & 9999, A; Tsai 57720, A); W. Yunnan, sine loco spec. (McLaren's Collector 'B' 82, K); Les prairies au col de Yen tse hay (Delavay 3371, P); Deqen Co.; Deqen (Atuntze), 2700 m (Wang 69866 & 69912, A, PE); Huan-fu-ping. 3000 m (Wang 69318, A); Zhongdian Co. (Dequin), Bitahai, from the entrance to Bitahai Lake, 3460–3750m (Murata et al. 1057, TI, TUS); SE. of Zhongdian, Xiajiuxiu, 3600–3800 m (Zhongdian Exped. 862, PE-744095); Weixi Co., Yeh-Chih. 3600 m (Wang 68328, A, PE-67595); Litiping between Likiang and Weihsi (Ching 22085, A); Lijiang Co., 2500 m (Wang 71648, A); Ahsi, NW. Likiang Snow Range on Yangtze. (Ching 21104, A); Eastern flank of the Lichiang Range, 27°5'N. 11000 ft. (Forrest 5982, E); East side of Mt. Yulongshuishan, between Mahuangba (3345 m) and Wudoudi (3750 m). (Murata et al. 607, TI); Yulongshan, Mahuangba, 3250 m (Inst. Bot. Acad. Sci. China, Kunming Station 22610, PE); Yunshanping, 3000–3100 m (Kato et al. 1838, TI); Ganhaizi, 3200 m (Ohba et al. 340, TI); Yulong Shan, Gangheba, rocky slope, 3250 m (Chamberlain et al. 605, E); Likiang Snow Range (Ching 30472, A); Rocky, shady situations at the base of and on ledges of cliffs in pine forests. on the eastern flank of the Lichiang Range, 27°15'N, 11–12000 ft. (Forrest 2606, E, K); ad cetera mont. niveor, prope Lichiang fu, ca. 3800 m (Schneider 1814, GH (excl. right plant); Lichiang, Ngukulo, 2600 m (Yü 15380, A, PE); Bijiang Co., Cher-tse-lo, 4000 m (Tsai 58227, PE); Yangbi Co.; W. side of Diancang Shan Mts. Range, ca. Dajiuping, 25°50'N, 99°59'E, ca. 2700 m (1984 Sino-Amer. Bot. Exped. 643, TI); Dali Co.; Talifou (Delavay s. n., 7 May 1882, P); on the Eastern flank of the Tali Range, 25°40'N, 9–11000 ft. (Forrest 4565, E). **Sichuan;** Muli, Wachin, Jungchi, 3100 m (Yü

14739, A); Muli, Lea-lang-kang-tin, 2400 m (Yü 7458, A, PE-340841); Yanyuan Co., Mt. Maoniushan, alt. 3500 m (collector unknown 925, 16 Sep. 1965, PE-1564862); Jiulong Co., between Chahuashuzi ? and Fangmapi, 3650 m (collector illegible, PE); Kangding Co., 2350 m (Chen 112505 & 27903, A); Haies et buissons a Tongolo (Soulié 272, NY); Batang Co., central district, Gongbojianana (collector unknown 1608, 7 Aug. 1972, PE); Yajiang Co., Xiangkelazong, 3600 m (Nanshuibeidiao Party 2692, PE); Dêgê Co., Goinqên, alt. 3800 m (collector illegible, PE).

**MYANMAR:** Valley of the Chawng maw hka. 8000 ft. (Kingdon-Ward 3419, E).

**Distribution and habitat:** Hengduan Mountain Region in Southwest China (eastern Tibet (Xizang), western Sichuan and northwestern Yunnan) and northern Myanmar. On margins of or in Coniferous forests or evergreen *Quercus* forests in cool temperate to subalpine zones and alpine grasslands. Alt. 2350–4000 m.

Occurrence of this taxon in Myanmar is the first report. Although the Kingdon-Ward's specimen cited above was correctly determined as *Polygonum sinomontanum* Sam. by Samuelsson in 1930, this result has not been published.

Flowering season: May–Sep.

***Bistorta henryi* Yonek. & H. Ohashi, nom. nov.** (Fig. 12).

*Polygonum amplexicaule* D. Don var.: Oliver in Hooker's Icon. Pl.: t. 1743 (1888).

*P. amplexicaule* var. *sinense* Forbes & Hemsl. in J. Linn. Soc. Bot. **26**: 333, in textu (1891); Steward in Contr. Gray Herb. **88**: 30 (1930); A.J. Li, Fl. Reipubl. Popul. Sin. **25** (1): 46 (1998), cum auct. epith. Forbes & Hemsl. ex Steward; T.Y. Ding in C.Y. Wu & al. (eds.) Fl. Yunnan. **11**: 340 (2000), cum auct. epith. Forbes & Hemsl. ex Steward.

*Bistorta amplexicaulis* subsp. *sinensis* (Forbes & Hemsl.) Soják in Preslia **46**: 152 (1974), non *B. chinensis* H. Gross (1913).

Syntypes: **CHINA:** Hubei Prov., Patung (A. Henry 1818, 2521 & 4061, K, non vidi).

*Polygonum amplexicaule* auct. non D.

Don; Dammer in Diels in Bot. Jahrb. Syst. **29**: 313 (1901), p. p.

*P. amplexicaule* D. Don var. *amplexicaule* auct.: A.J. Li, Fl. Reipubl. Popul. Sin. **25**(1): 52, p. p., pl. 9; 1–3 (1998); T.Y. Ding in C.Y. Wu & al. (eds.), Fl. Yunnan. **11**: 339, p. p. (2000).

A gynodioecious perennial herb. Rhizome thick, to 1 cm diam., reddish purple inside, horizontally elongated and branched. Stems 70–110 cm tall, 5–8-leaved, much-branched from middle and upper nodes, internodes pale green, grooved, glabrous or retrose-pubescent. Radical leaves absent at flowering time. Lower cauline leaves long-petioled; blades broadly to narrowly ovate or triangular-ovate, 6–13 cm long, 3.5–6.5 cm wide, acuminate at apex, cordate at base, chartaceous, green above, paler or somewhat glaucous beneath, glabrous except margins or sometimes micropapillate throughout above, glabrous or pubescent on veinlets beneath, margin papillate, not revolute, veinlets papillate but hardly thickened near margin; petioles 4–10 cm long, wingless, glabrous or papillate. Middle ones with petioles 0.5–5 cm long, blades narrowly triangular-ovate to narrowly ovate, 10–17 cm long, 3.5–5.5 cm wide, acuminate at apex, cordate at base; upper ones smaller upward, sessile, acuminate at apex, cordate and amplexicaul at base. Inflorescences long-cylindrical, erect, 7–14 cm long, 10–15 mm thick, flowering upward, upper nodes 1–3-flowered, lower ones 3–8-flowered. Bracts brown, chartaceous, ovate, 6–10 mm long, acuminate at apex, completely surrounding the inflorescence rachis forming a short tube at base; pedicels 4–7 mm long, stramineous, apex slightly thickened, red-purplish. Perianthes campanulate, pink or pink-purple, 4.3–6.7 mm long, both hermaphrodite and female flowers similar in size and shape; tepals oblong-ovate, 3.9–6.3 mm long, subacute at apex, apex of abaxial side of outer tepals weakly keeled. Stamens of hermaphrodite

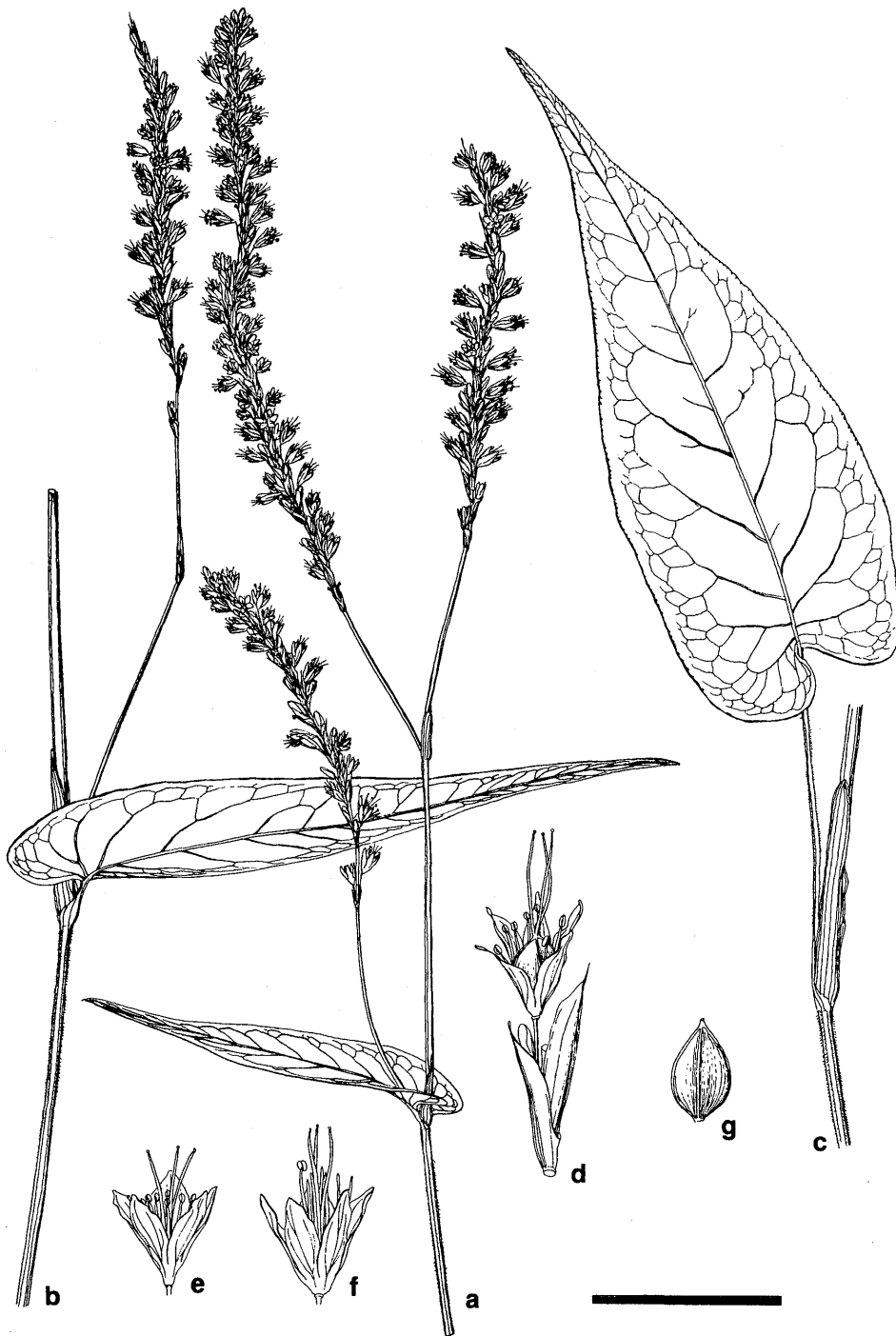


Fig. 12. *Bistorta henryi* Yonek. & H.Ohashi. a, b: Upper part of the stem. c: Lower part of the stem with a cauline leaf. d: Part of the female inflorescence rachis. e: Female flower. f: Hermaphrodite flower; anthers almost fallen off. g: Achene. Scale bar = 4 cm for a–c; 8 mm for d–g. Voucher specimens. a–c: Boufford & Bartholomew 24906 (TNS). d, g: Boufford & Bartholomew 24339 (TUS). e: Boufford & Bartholomew 24339 (TNS). f: Boufford & Bartholomew 24466 (TUS).

flowers distinctly exserted from perianthes, filaments 5–6.7 mm long, white or pink, anthers 0.6–0.8 mm long, deep purple. Stamens of female flowers included, filaments short, anthers less than 0.5 mm long, red, sterile. Styles 3, long-exserted from perianthes, pink, filiform, stigmas small, capitate. Achenes trigonous, ovate at lateral view, 3.5–4.5 mm long, 2.2–2.8 mm thick, brown, opaque, apex beakless or very shortly beaked.

Representative specimens examined. **CHINA:** **Yunnan;** W. Yunnan, sine loco spec. (Forrest 28953, PE); Weixi Co., Weihsi-hsien, 2600 m (Tsai 57924, PE-68446); *ibid.*, 3000 m (Wang 67665, PE); Eryuan Co., Mt. Luoping-shan (Ching 23117, PE-298623); Yangbi Co.; Zhong-shan, Bai-sha-he, 2200–2700 m (Cheng et al. 2794, TI, TUS); Dali Co.; foot of Mt. Cang Shan, Qing Bi Xi, along gorge, ca. 2100–2300 m (Koyama et al. 900, 902 & 982, KYO); Mt. Cang Shan, N. slope of San Yang Feng Peak, 2500–3000 m (Koyama et al. 682, KYO); Liang-shan, La'mi, 2100 m (Tsai 52137, PE); Chengkang Snow Range, 3000 m (Yü 17205, PE-298716). **Sichuan;** Nitou (Huang et al. 2617, PE); Hanyuanhsien, Sianglingshan, 2300 m (Wang 8831, PE); Hsiao-liang-shan, 2200 m (Yü 4090, PE-67964); Leibo Co., Leibo (Yü 4090, PE); Mianning Co., Taose, Yilesan.?, River, 2500–2600 m (Wu 1961, PE-694824 & 25); Shimian Co. ('Shihmien-hsien') (Hsieh 41974, 41886, 42473, 42517 & 42058, PE); Ganluo Co., Haitang, 2000 m (collector unknown 4313, PE-661951); Yuexi Co., Zhongsuoba, around crop field, 1700 m (collector unknown 3548, PE-663944); Baoan, Dalongtang, 2000 m (collector unknown 3825, PE-664587); Tianqian Co., Erlangshan, near Dadingping (Hu & He 11711, PE-248779); Emei Co., Mt. Omei, Maanyao, 2200 m (Tu 721, PE-67963); Emeishan, Chudian, alt. 1800 m (Guan et al. 1500, PE-845494); Hongya Co., Wawushan, Shuangdongxi (Yao 2530, PE-214742); Dujianyan Municipality (formerly Guan-xian), Zhaogong Mountain, vicinity of Sanwangmiao, 1000–1100 m (Boufford & Bartholomew (with Li & Zhu) 24339, TI, TNS, TUS); between Guanmengji and Guihuashu, upstream from Longxi along the Longxi River and on adjacent slopes, 950 m (Boufford & Bartholomew (with Li & Zhu) 24466, TNS, TUS); W. side of Longxi River, above Longxi, 1450 m (Boufford & Bartholomew (with Li & Zhu) 24906, TI, TNS); Guan Xian; Longxi. 1100 m (Wang et al. 870183, KYO, TI); Luojiaping, 1400 m (Wang et al. 870349, KYO, TI); Tatsienlu, Summit of Mountain (McLaren's Collector 'AC' 251, ann. 1938,

KYO). **Hubei;** Hupeh, sine loco spec. (Henry 4976, TI); Shennongjia, Dayanwu, Dushangou, 1650 m (PLA 236th unit 59176-2450, PE-1647547 & 1647548); Shennongjia Forest Distr. (31°30'N, 110°30'E), E. side of the Mengjia River in the vicinity of Hongriwan constriction camp, ca. 1300 m (Bartholomew et al. 501, KYO); Hing-shan (Li 996, PE-737261); Jianshi Co., Huaguoping, Changling, 1250 m (Dai & Qian 263, PE-252029); Padong Co., near Niudongwan, 2100 m (Chuan & ? (illegible) 00905, PE-737261). **Hunan;** Shimen Co. (collector unknown 1345, 3 Nov. 1974, PE). **Gansu;** Wen-xian, Bikou, Liujiala, 1100 m (Wang 470, PE). **Shaanxi;** Hanzhong, Nanzheng Co., Wuba, 1200 m (collector illegible 163, PE-1175379).

Distribution and habitat: Southwest and Central China (Yunnan, Sichuan, Hubei, Hunan, Gansu, Shaanxi, Henan, Jiangxi). Riverside scrubs or wet grasslands of temperate to subalpine zone. Alt. 1100–3100 (–3600) m.

Flowering season: Jul.–Sep.

Nomenclatural note: The specific epithet is dedicated to Mr. A. Henry for his great contribution to the flora of Central China.

Oliver (1888) illustrated and briefly described this taxon based on Henry's specimens as "*Polygonum amplexicaule* D. Don var." but withheld naming it. Forbes and Hemsley (1891) cited the illustration and the brief description of Oliver (1888) and gave a varietal epithet *sinense*. Although the publication by Forbes and Hemsley (1891) lacks any description, this varietal name should be regarded as validly published by them, not by Steward (1930).

We wish to express our sincere thanks to Professor Masayuki Mikage, Faculty of Pharmaceutical Sciences, Kanazawa University, for the first author to join the 1995 and 1996 expeditions to Nepal. We also appreciate Professor Mitsuo Suzuki, Botanical Garden, Graduate School of Science, Tohoku University and Professor Jin Murata, Botanical Garden, University of Tokyo, for their kind providing of unidentified materials collected in their expeditions. We also thank the curators of the herbaria A,

BM, E, GH, K, KANA, KATH, KYO, MAK, NY, P, PE, SAP, TI and TNS for making their specimens available. Field researches in Nepal are financially supported by the Grant-in-Aid for Monbusho International Scientific Research Program no. 07041132 (1995–6) from the Ministry of Education, Science, Sports and Culture, Japan to M. Mikage and Visiting PE was supported by the Grant-in-Aid for the same program no. 10041153 (1999) to H. O. Unidentified materials used in this studies were collected in the expeditions to Nepal financially supported by the Grant-in-Aid for the same programs nos. 16041043 and 09041143 to M. Suzuki.

### References

- Anonymous 1974. Polygonaceae. In: North-West Botanical Institute, Chinese Academy of Science (ed.), *Flora Qinlingensis* 1(2): 133–168. Science Press, Beijing (in Chinese).
- Ding B.-J., Wang J.-Y. and Gao D.-Y. (eds.) 1981. *Flora of Henan*. 1: 632 pp. Henan People's Publ., Kaifong (in Chinese).
- Don D. 1825. *Prodromus Florae Nepalensis*. Londini.
- Forbes F. B. and Hemsley W. B. 1891. Polygonaceae. An enumeration of all the plants known from China proper, Formosa, Hainan, Corea, the Luchu Archipelago, and the island of Hongkong, together with their distribution and synonymy. *J. Linn. Soc. Bot.* 26(176): 332–358.
- Grierson A. J. C. and Long D. G. 1983. Polygonaceae. *Flora of Bhutan* 1(1): 153–175. Royal Botanic Garden, Edinburgh.
- Hara H. 1952. Contributions to the study of variations in the Japanese plants closely related to those of Europe or North America. Part 1. *J. Fac. Sci. Univ. Tokyo Sect. 3, Bot.* 6(2): 29–96.
- 1975. Polygonaceae. In: Ohashi H. (ed.) *Flora of eastern Himalaya. Third Report*. The University Museum, the University of Tokyo, Bulletin no. 8: 29–30.
- 1982. Polygonaceae. In: Hara H., Chatter A.O. and Williams L. H. J. (eds.) *An Enumeration of the Flowering Plants of Nepal*. 3: 172–180. British Museum, London.
- Haraldson K. 1978. Anatomy and taxonomy in Polygonaceae subfam. Polygonoideae Meisn. emend. Jaretsky. *Symb. Bot. Upsal.* 22(2): 1–95.
- Hooker J. D. 1886. Polygonaceae. *Flora of British India*. 5: 22–61. L. Reeve & Co. Ltd., London.
- Hong S.-P. 1992. Taxonomy of the genus *Aconogonon* (Polygonaceae) in Himalaya and adjacent regions. *Acta Univ. Upsal. Symb. Bot. Upsal.* 30(2): 1–118.
- Kitagawa M. 1938. Materials to the flora of eastern Asia. II. Rep. Inst. Sci. Res. Manchoukuo 2: 281–314.
- Li A. J. 1983. Polygonaceae. In: Wu C.Y. (ed.), *Flora Xizangica*. 1: 593–627. Science Press, Beijing (in Chinese).
- 1993. Polygonaceae. In: Wang W.T. (ed.), *Vascular Plants of Hengduan Mountains*. 1: 349–369. Science Press, Beijing.
- 1998. *Polygonum* L. *Flora Reipublicae Popularis Sinicae* 25(1): 3–96. Science Press, Beijing (in Chinese).
- Meisner C. F. 1826. *Monographiae Generis Polygoni* Prodromus. 117 pp. Genevae.
- Miyamoto F. 1999. *Bistorta*. In: Akiyama S., Ikeda H., Miyamoto F., Noshiro S., Ohba H., Fang R.-C. and Wu S.-K. An enumeration of the flowering plants collected in NW Yunnan and SW Sichuan, China between 1984 and 1998 – *Bistorta* (Polygonaceae), *Potentilla* (Rosaceae), *Saxifraga* (Saxifragaceae), *Rhododendron* (Ericaceae) and *Juncus* (Juncaceae). *Bull. Natn. Sci. Mus. Tokyo ser. B (Bot.)* 25(4): 151–155.
- Munshi A. H. and Javed G. N. 1986. *Bistorta* (Linnaeus) Adanson. Systematic studies in Polygonaceae of Kashmir Himalaya. *H. Econ. Taxon. Bot. Addit. Ser. 2*, 4: 58–61.
- Oliver J. 1888. *Polygonum amplexiaule* D. Don, var. In: Hooker J. D., *Icones Plantarum*: t. 1743.
- Park C.-W. 1988. Taxonomy of *Polygonum* section *Echinocaulon* (Polygonaceae). *Mem. New York Bot. Gard.* 47: 1–82.
- Ronse Decraene L. P. and Akeroyd J. R. 1988. Generic limits in *Polygonum* and related genera (Polygonaceae) on the basis of floral characters. *Bot. J. Linn. Soc.* 98: 321–371.
- Samuelsson G. 1929. Polygonaceae. In: Handel-Mazzetti H. (ed.), *Symbolae Sinicae* 7: 166–188. Springer Verlag, Wien.
- Steward A. N. 1930. The Polygoneae of eastern Asia. *Contr. Gray Herb.* no. 88: 1–129.
- Yonekura K. and Ohashi H. 1999. A revision of plants hitherto referred to *Bistorta milletii* (Polygonaceae) in Nepal. *J. Jpn. Bot.* 74: 329–343.
- and — 2001. Taxonomic studies of *Bistorta* (Polygonaceae) in the Himalayas and adjacent regions (1). *J. Jpn. Bot.* 76: 344–353.

米倉浩司<sup>a</sup>, 大橋広好<sup>b</sup>: ヒマラヤと周辺地域のイブキトラノオ属 (タデ科) の分類学的検討 (2)

*Bistorta amplexicaulis* (D. Don) Greene とその近縁種について報告する. 短くて分枝せずにねじれた太い根茎を持つ種が多いイブキトラノオ属の中にあって, *B. amplexicaulis* は地中を横走り分枝する太い木質の根茎を有する点で特徴づけられる種である.

タデ科タデ亜科植物では托葉鞘は亜科を特徴づける器官であることもあって古くから注目されてきたが, 托葉鞘のつく葉鞘部についてはこれまで殆ど言及されてこなかった. しかし, タデ亜科イヌタデ連の植物について葉鞘部を調べた結果, イブキトラノオ属の大部分の種では茎葉の葉鞘が筒状に長く発達し, 托葉鞘は上部の茎葉ではしばしば痕跡的となるのに対し, イヌタデ連の他の属では托葉鞘は発達するが葉鞘はごく短く殆ど筒状にならないことが明らかとなった. しかし, イブキトラノオ属の中で *B. amplexicaulis* をはじめとする少数の種は, イヌタデ連の他の属同様に茎葉の葉鞘は殆ど発達せず, 一方で托葉鞘がよく発達する. イブキトラノオ属に普通に見られる短い根茎を有する種は全て葉鞘が発達する点を考慮すると, 葉鞘が発達するという特徴はイブキトラノオ属で生じた派生形質と考えられ, この特徴を持たない *B. amplexicaulis* は属内では原始的な位置にあることが示唆される. *B. amplexicaulis* は, ユーラシア大陸に広く分布するイブキトラノオ (広義) *B. major* と葉形が類似するが, イブキトラノオでは葉鞘がよく発達し上部の茎葉の托葉鞘はごく短いため, 根茎が無くても両者は容易に区別できる.

ブータン以西のヒマラヤ地域に分布する *Bistorta amplexicaulis* は, 高山帯に産し花序が下垂する型と, 温帯～高山帯に生育し花序が直立する型とに大別できる. 花序が下垂する型は, 従来 1 変種 *var. pendula* H. Hara が中部ネパールの Manaslu 山系からブータンにかけて知られていたが, これに加えて中部ネパールの Annapurna 山系と Dhaulagiri 山系の南側の高山帯に, それに類似するが花序の構造や花色, 花被片の形態が異なる型が生育していることが明らかとなった. これらの地域と *var. pendula* の生育地とは Marsyandi 川によって隔離されており, Dhaulagiri 山系の南側において現地調査を行った限りではこの型と花序が直立する *var. amplexicaulis* は混生することは少なく, 中間型も殆ど見られなかった. そこでこの型を新変種と認め, *var. dhorpatanensis* Yonek. & H. Ohashi と命名した. 一方, 花序が直立する型は, 花序や花色, 大きさに大きな変異が認められ, 複

数の種に分けられたり, いくつかの種内分類群が認められることもあった. 確かに分布域の東方には花序が短く花が大きく鮮紅色の個体が多く, 西方には花序が長く花が小さく白色～淡紅色の個体が多い傾向が認められるが, 両者の間には中間型が多く見られ, 地理的なすみ分けは明瞭ではないので, 現時点では変異の多い 1 変種 *var. amplexicaulis* として扱っておくのが妥当である. Munshi and Jabeid (1986) がカシミールからエゾイブキトラノオ *B. pacifica* (Petrov ex Kom.) Kom. として報告した標本は, その写真と記載を見る限り, 茎が分枝して茎葉の葉鞘が発達せず, 托葉鞘がよく発達するなど, *B. pacifica* とは一致せず, *B. amplexicaulis var. amplexicaulis* の 1 型に過ぎないものと考えられる.

中国南西部の横断山脈周辺に生育する *B. sinomontana* (Sam.) Miyam. は, 原記載をはじめ多くの文献では葉形の類似からイブキトラノオに近いものとして扱われ, その異名とする意見さえあった (Steward 1930 等). しかし, 根茎の形がイブキトラノオとは大きく異なり *B. amplexicaulis* と類似することから, 近年は独立種として扱われている. 根茎の形態の他に, 茎葉の葉鞘が発達せずに托葉鞘が発達する点も *B. amplexicaulis* と一致する. さらに, 葉形には変異が大きく, ヒマラヤの *B. amplexicaulis* に酷似した葉形の個体もしばしば見られる. Miyamoto (1999) は *B. sinomontana* の葉柄に翼が発達する点を重視して独立種として扱っているが, ヒマラヤの *B. amplexicaulis* にも狭い翼を持った個体が認められ, 明瞭な区別点とはならない. 両者の間には, 花序における開花の方向や花被片の形態等にも僅かな違いが認められるが, これらの特徴だけでは別種とするには十分ではないように考えられる. 分布域の差を考慮すると, *B. sinomontana* は *B. amplexicaulis* の亜種として扱うのが妥当であると結論される. *B. amplexicaulis ssp. sinomontana* は従来中国の固有と考えられてきたが, ミャンマーにも産することが明らかとなった.

中国南西部から中部の暖温帯～冷温帯域にも, 従来 *B. amplexicaulis* の変種または亜種 *subsp. sinensis* (Forbes & Hemsl.) Soják (= *Polygonum amplexicaule var. sinense* Forbes & Hemsl.) とみなされてきた型が生育している. この型は従来, ヒマラヤの *B. amplexicaulis* とは花序や苞, 瘦果の形質により区別されてきたが, 本研究の結果, これ以外に, 雌性両全性異株であり, 苞が基部で花

序軸を完全に囲み鞘状になる点で大きく異なることが明らかとなった。さらに、この型と中国南西部において同所的に生育する subsp. *sinomontana* とは、葉柄に翼が全く無いことでも容易に区別でき、両者の間には中間型は認められないことがわかった。この型は *B. amplexicaulis* に近縁ではあるが、むしろ別種として扱うべきである。別種とした場合、従来の形容語 *sinensis* は、*B. chinensis*

H.Gross という先行名があるので、基準標本の採集者にちなみ *Bistorta henryi* Yonek. & H.Ohashi の新名を提案する。

(<sup>a</sup>東北大学大学院理学研究科  
附属八甲田山植物実験所,  
<sup>b</sup>東北大学大学院理学研究科  
附属植物園津田記念館)